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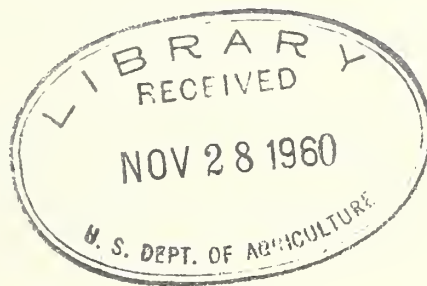
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ON THE THEORY OF EVALUATING FARMLAND

BY

THE INCOME APPROACH



UNITED STATES DEPARTMENT OF AGRICULTURE

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ON THE THEORY OF EVALUATING FARMLAND
BY
THE INCOME APPROACH

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THE PROBLEM

Determining a price for farmland is problematic for four main reasons:

(1) The value of any good is a judgment performed by an individual. All values are relative and subjective. A thing has value to an individual in reference to some other thing, and the relative weighting between any two items is a matter of opinion.

(2) Each unit of land ownership differs from every other unit. Therefore, the value of any unit is unique in that one entity does not substitute perfectly for another as do standardized factors or products.

1/ It is impossible to acknowledge in full the debt to the literature and to colleagues for assistance in the preparation of this report. Now and then reference is made by footnote to particular points in the literature. In general, however, the process has been one of building over a period of years, incorporating ideas from printed pages and from discussions. The resulting form is attributable to no one in particular, but its parts are attributable to many. The author is particularly indebted to members of the North Central Land Tenure Research Committee, and to the Subcommittee on Land Prices and Credit, without whose stimulation and encouragement the work could not have been initiated or completed. This report expresses the views of the author on the questions considered. It is intended to stimulate thought on issues in an important area of economic theory meriting discussion and debate.

(3) Farmland is valuable for both production and consumption purposes. People want land (and buildings) because of the income-earning possibilities as well as for such direct want-satisfying characteristics as a beautiful view or location in a specific community.

(4) More than any other economic good, land has associated with it strong traditional and social value judgments, many of which are reflected in the customs and laws that affect transfer of ownership.

Further, among the customary practices that complicate the determination of price is that land is usually evaluated, utilized, and transferred as a composite part of a real estate unit. Land, buildings, improvements, and often standing crops and operating equipment are priced and sold together.

The price of land or any other good is a monetary expression of relative value. The problems of land valuation center on establishing a price for a transaction such as transfer of ownership, mortgaging, renting, or assessment for taxation. The concern of individuals with the pricing process and the price lies in the consequences involved for themselves and others, temporally and intertemporally, within the firm, between individuals, between firms, and between industries.

Interest in or concern with the price of any economic good, or with the procedure through which that good is priced, arises primarily because of the effects of its price upon allocation among uses and users. Land as a special case of a producer good is priced in a market and the price reflects buyer and seller estimates of value for specific uses. The function of price per se is allocative. Likewise, the function of any price for land as a consumer good is allocative. Land as a consumer good is used by households, and price is the allocative device among households. Land as a producer good is used by firms; allocation among firms is performed at a price.

For both buyers and sellers of land as a producer good, production theory offers guides to decision and action. On the assumption that producer goods are owned or controlled and used for their income-producing ability, the pricing of land is a problem in factor pricing. Production theory specifies the conditions for maximizing the value of product from a given quantity of several resources. Land is valuable as a result of the product or service it produces in combination with other factors. Theory provides the relevant choice indicators in making the combination.

What happens in the case of a given tract of land that may be used either for a consumption use (such as residence or recreation) by a household or for a production use (such as farming, forestry, industry or mining) by a firm?

Clearly, in either instance, the land is valuable because of the flow of service or product it produces through time. For the consumption use within a household, the limit to price is a subjective determination made in terms of what the household can afford or desires to pay. For the productive use within a firm, the economic limit to price is the sum of the discounted marginal value products - or within each production period, the limit to price is the equating of the cost of land and the return from it. 2/

It is the problems of measurement, of empirical determination, of subjecting relations to qualitative tests, of specifying limits, that cause difficulties. The main problem in application of marginal analysis is that of measuring marginal quantities. As yet, we do not know, specifically, the effect of one input in a complex of inputs, because some of the variables are not subject to control. Accurate measurement is impossible. The exact relations can only be approximated, determined within some range, or premised on stated assumptions.

Despite the problems of measurement, however, the only apparent solution to current economic problems of land pricing is for evaluators to apply the best that is known in theory. For pricing farmland, this is primarily the application of theory of the firm. In other terminology, it is the theory of production.

Use of the theory should enable individuals to decide among alternatives, and to appraise the consequences of given actions. Its use may not explain human behavior. People may not act in the way the theory assumes; for example, farm operators may not choose between products by consciously equating the ratios of marginal products and product prices. Yet their behavior can be explained in terms of departure from that norm. Also, the only difference between what the individual thinks he does and what the researcher deduces concerning a given action or choice may lie in the terminologies of the two. There are many instances of "as if" actions, even though the individuals may not know the meaning of the phrase "equating the marginal value product of the factor in each of its uses in the firm."

The contribution that theory can make to more orderly and systematic pricing of farmland depends on the content of the theory and on understanding the nature of the basic economic problems associated with pricing. Also involved are the opinions held as to function of theory. One explanation of the differences of opinion concerning theory of value - as to both content and

2/ This is the case of the firm with sufficient capital to equate marginal cost and marginal revenue of all factors. In the case of limited capital, the ratios are equated.

applicability - is that all too often the statement of theory does not specify whether its purpose is to explain existing situations and reality, or is to serve as a guide to thinking and action.

The difference between these two concepts of the function of theory is important because lack of distinction interferes with application of theory to problems. Particularly, theory designed to construct what is rational, to serve as a basis for obtaining order out of chaos, to guide actions effectively toward achievement of specific goals, is often criticized because it is not realistic and does not explain the existing situation. Figuratively, this is comparable to condemning a corn binder because it cannot be used to harvest wheat.

No attempt is made here to explain how prices are determined in the market or how buyers and sellers behave. Instead, attention is devoted to providing thought guides to action. Some of these guides evolve directly from orthodox theory, and others from generalizations drawn from observation.

The kind of theory needed in the valuation of farmland is a body of related ideas and principles that will both simplify relations between economic variables and emphasize essentials. One important function of theory is to simplify. Reality is often a maze or complexity of details in which there appears to be little rhyme or reason. Theory can abstract from this complex by segregating the essential points. Through logical reasoning, patterns of thought that will guide actions can be constructed. The test of such theory lies in its results through use, not in comparisons with current practices and thinking. Current practices themselves may cause problems.

This discussion of the theory of land pricing is focused at the firm (and household) level because it is within firms (and households as related to firms) that decisions are made concerning land prices. Group and government actions funnel through firms and affect decisions as to kinds and quantities of resources used. The individual farm firm influences neither product nor factor prices - particularly those that are standardized to the extent that any one unit is perfectly substitutable for another. For example, one ton of a given fertilizer mix is the same as any other ton of that mix; or one tractor is a perfect substitute for another of the same brand name, size, and model. The firm (or household) does influence the price of the land it acquires or sells, because as a factor land is unique; its price is unique and is determined partly by bargaining. The firm itself is usually involved in the price-determining process for the land it acquires or sells.

For purposes of evaluation, farmland is defined here in terms of unit area. It includes the natural resources (fertility, structure, and topography) and the added physical inputs incorporated with and inseparable from it. It varies through time (between production periods) with use and treatment. Land is a genus, made up of specie classes or grades. Land is distinct from such structural features as buildings and fences, but it is inseparable from such incorporated improvements as tile drain or absorbed labor. Distinction must be made also between land and water, at least in surface areas of streams and lakes, but not in water content or holding capacity of soil. The essential distinctions are between land, real estate, and other capital goods - not between man-made characteristics and phenomena of nature, because within limits man can change the characteristics of land. In any significant economic sense, land is a form of capital. 3/

The term "land services" is used to include all aspects of output from land. A land service is defined as any homogeneous type of output, any product, good, or function that flows from or is associated with land. All land services are partly attributable to other factors. Corn, for example, is a land service that results from labor and capital inputs on land.

In broad perspective, the basic problems that confront the decision-maker in the firm (or household) in pricing farmland are these: (1) Separating the real estate bundle into its component parts and determining the quantities of lands of different qualities or grades; (2) estimating the earning capacity of each grade of land under one or more combinations of factors; (3) translating the flow of income into a fund of present value; (4) distinguishing between firm (production) and family (consumption) expenditures and returns; and (5) evaluating nonmonetary phenomena.

Each of these is an area of judgment to which understanding and application of principles of economics can contribute.

3/ In this definition, no distinction is made between man-made and natural characteristics. Taking the land as it is at any given time, it cannot be determined which part of a characteristic such as fertility is a natural phenomenon. The distinction between man-made versus natural characteristics is of significance only so far as the nonreproducible characteristic affects supply and thereby use of that characteristic.

DEFINING AND CLASSIFYING LAND AS A FACTOR

The farm real estate market departs significantly from the concept of a perfect market. Its imperfections draw more attention than do its conformities to this conceptual norm. Statement of the imperfections is sometimes used as proof that the perfect market concept is meaningless in any explanation of factor pricing. But concentration on the imperfections per se, with no attention to how these imperfections, when stated as departures from a norm, indicate paths to problem solution, overlooks the function of theory. Study of the market - assembling information and describing the present situation - is an integral part of the application of the conceptual norm. The nature and extent of the departures indicate the areas in which something needs to be done, through either individual or group action, to effect an improvement.

The farm real estate market is an imperfect factor market in that farms are transferred as units. The units are heterogeneous. The quoted price is for a composite unit that includes land, buildings needed in production processes, housing used by the farm family, and possibly standing crops, machinery, livestock, and equipment. No two farms are identical (but an individual may be indifferent in choosing between two similar ones). The significance of this imperfection (departure from norm) rests in the indefiniteness or lack of meaning of prices as a measure of value of farms as units.

There is no logical objection to sale of farms as units. The objection is to pricing them as units without evaluating the component parts of the unit. To have any particularized meaning, one unit of a factor must be a perfect substitute for another. This does not mean that it is identical with another. No two bushels of wheat are identities, but two properly graded bushels are perfect substitutes for each other.

Farms are packages of factors, not factors. Effective and meaningful pricing practice requires that the package be separated into constituent parts. First, separate the parts that are as different in characteristics as are land and buildings. Second, classify the land (and other factors) in meaningful categories, so that each unit within the category is a perfect substitute for any other unit in it.

Admittedly, the problems of classifying land are many. But the purpose of classification is clear. The exact characteristics of the grade as such are less important than the selection of a system of gradation through which distinction can be made in productivity, and price differentials can be established by grades so that price reflects differences between grades.

Whether land classes are established and lands are surveyed and mapped so that classification data are available for all parts of the country is not a critical issue in improvement of land-pricing practices and functioning of the land market. It is more important that buyers, sellers, lenders, borrowers, and appraisers think in terms of grades and devise and use a set of grades that will be sufficient for their evaluation problems.

For land-pricing purposes, the basis for distinction between grades is productivity. Whether the product is a crop, a location, a view, or some other service, distinctions can be made in the quantity of service that each defined grade can or will produce. The problem of defining and classifying land is related inseparably to the problem of allocating returns to factors in the production sense and to measuring satisfactions in the consumption sense.

In this framework, the farm valuation problem is reduced to sets of common denominators. The constituent parts are appraised separately, each within a specific economic rationale. Decision as to valuation of the farm or tract as a whole can then be made as a sum of its parts and in comparison with alternatives - part by part and for the farm as a whole.

ESTIMATING EARNING CAPACITY BY ALLOCATING RETURNS TO FACTORS

No problem in economic analysis is less satisfactorily solved, in terms of calculation procedures widely applicable by laymen than is the problem of determining earnings of different inputs at a given level of intensity in a multiple-product firm. The problem is one of measurement as well as one of valuing.

In brief, the theory of production for the single-product firm is that the most profitable output is where marginal cost is equated with price per unit of the product. Return to the fixed factor at this output is the difference between marginal revenue and average variable cost per unit of output multiplied by the number of units of output. 4/

The principles are the same for the multiple-product firm. But the calculation is more complex. At the highest profit combination, it is impossible to substitute product for product or factor for factor to achieve a higher value of output.

4/ See Boulding, K. E., *Economic Analysis*, New York, 1948, pp. 510-512, for graphic illustration and explanation.

At any one point of time, the distribution of resource ownership is taken as given. The prevailing levels of income, tastes, preferences, and values determine the amounts people are willing to pay for goods and services. The prices of goods and services of particular types may be influenced or even determined by the monopolistic or oligoplistic position of some firms. Resource owners, conditioned by their own tastes, preferences, abilities, and amounts of resources owned, view the income-earning opportunities open to them by investment in production of different goods and services. They choose to invest in the industry which in their estimation offers the greatest marginal efficiency of capital and is consistent with their liquidity preferences and capital positions.

Investment opportunity within an industry is determined by a number of forces or relations. In a given type of industrial enterprise, an investor with limited capital may have opportunity only to buy stocks or bonds issued by the small number of firms that make up the industry. He is unable to enter the industry and establish another firm because of the total capital requirements or the power exercised by firms already in the industry. Also, a resource owner may prefer to have his capital in a readily available, transferable form. His degree of willingness to bear risk causes him to choose among industries and among firms within an industry; that is, he may prefer a low and certain return compared with a possible higher and uncertain one. In the long run, resource owners choose among income-earning opportunities in different industries and shift from industry to industry so that to them the marginal efficiency of capital is equal. The decision to invest is *ex ante* but is subject to change, *ex post*, if returns do not come up to expectations and if alternatives promise higher rates of return on investment.

The choice of investment opportunity takes the same form within an industry as among industries. Choice is made within an industry, between firms and among enterprises within a firm, or between opportunity in a firm through operation and management as compared with investment of capital in part of a firm (a mortgage on land, capital stock, a chattel on cattle and the like).

Within the firm, the resource owner appraises income-earning opportunity of investment in and use of varying quantities of different factors. It is within the firm that factor productivity functions. It is at the firm level that resources are combined in production. Physical production (the marginal physical product) is a function of proportioning of factors. Value productivity is a function of physical productivity and the sets of prices for factors and products.

This brief review of choice of income-earning opportunity sketches the general relation between factor productivity and the environment in which factors are priced. The rationale of choice of enterprises (product combinations) and of levels of output is treated in detail in the literature. ^{5/} But it may be well to emphasize that factors have alternative uses among industries, among firms, and among enterprises within firms. Capital resources are invested in firms, and in factors to produce goods or services within firms. The decision to invest in a fixed factor such as land is a resultant of comparative estimates of the marginal value productivities of factors other than land.

The purpose in determining factor earnings at different levels of input (varying combinations) is to achieve efficient use of resources. Farm firms operate from year to year with selected factors held constant (land, buildings, machinery). These have fixed costs for a production period. Variables tend to be applied to these fixed resources in ratios determined by experience in the community. Some of the proportions are fixed. It takes one operator per tractor, one tractor to pull a plow, and about the same equipment to operate 160 or 200 acres. Thus, there is fixity in inputs. Factors are added in lump units - a second or replacement tractor, another 40 acres, and often, another man rather than labor hired by the hour. Factor combinations are determined within some range of input and it is not possible to add small units of all factors. From this, it follows that incremental returns can be determined only in ranges commensurate with the unit of input. Approximating the return for the additional input by the best possible estimating procedure can provide the data for the decision as to whether to make the input. The problems of estimating returns to inputs and determining level of operation run hand in hand.

The main function that knowledge of marginal costs and marginal returns performs, is to determine the level of operation for the firm and to allocate resources between firms. But few operators have knowledge of marginal costs and returns per unit of product. Earnings of factors for a given combination of inputs must be approximated. Operators lack the information from which to calculate variable costs over a range of

^{5/} See Heady, E. O., *Economics of Agricultural Production and Resource Use*, New York, 1952; Stigler, G. J., *The Theory of Price*, New York, 1947; Boulding, K. E., *Economic Analysis*, op.cit.; and Leftwich, R. H., *The Price System and Resource Allocation*, New York, 1955.

output or over a range of input of different factors - among other reasons, because they cannot afford to experiment to find out. But they should know their costs for a given combination and at a given output.

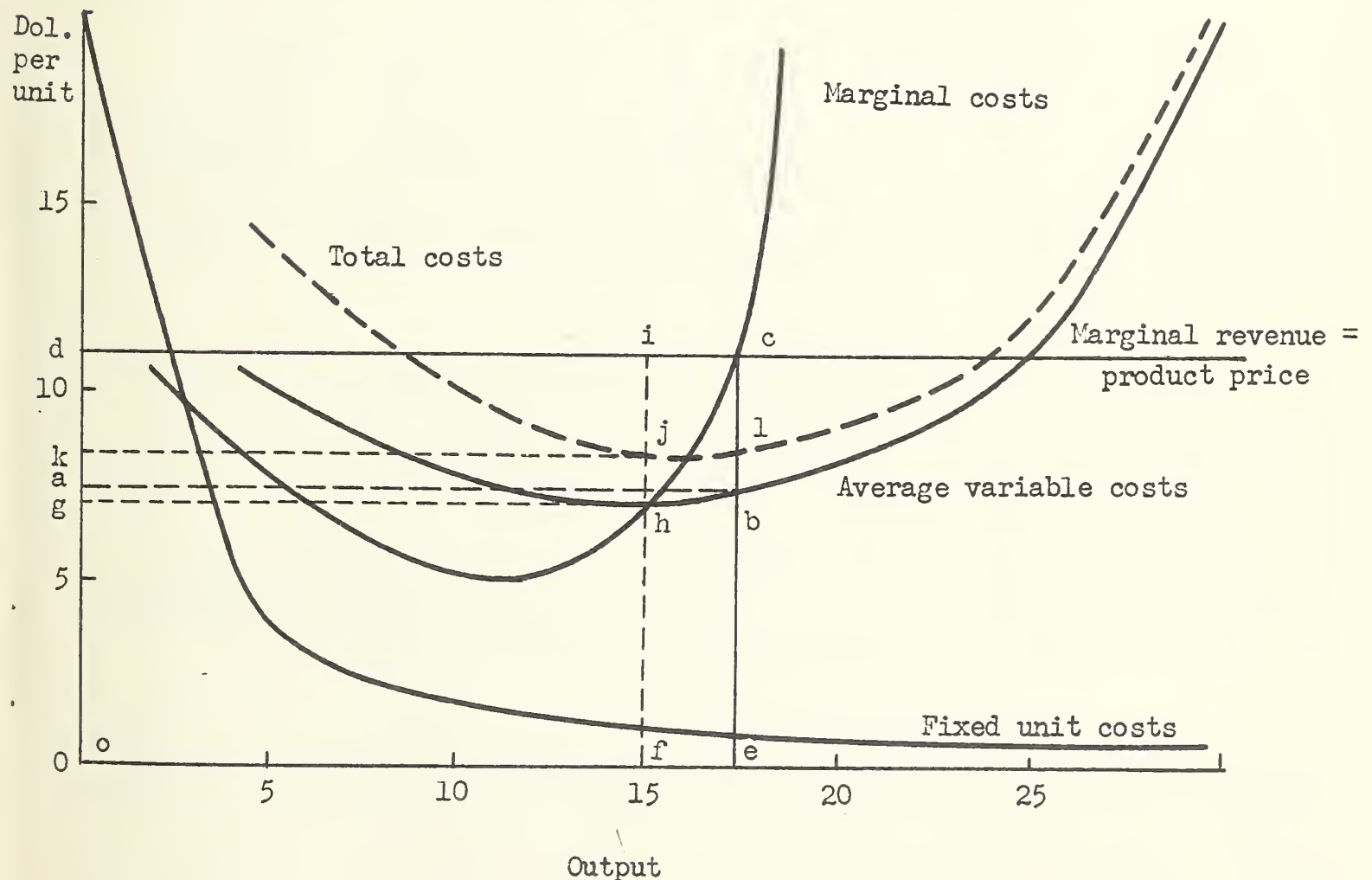
The phrase "earnings of factors" is chosen purposely. Any method of estimating factor earnings, in the absence of perfect knowledge or of proof that the firm is at its highest profit combination, can only approximate the true marginal value products of the resources. This applies to linear programming, Cobb-Douglas functions, and other methods, including all forms of residual imputation. One method may be more accurate than another and may provide a closer estimate of the true marginal value product. But if approximating procedures are to be of use to many farm operators, they will need to be directed toward methods using only simple arithmetic. In this, technicians have a significant role, that of checking simple alternative devices against the best that can be done through the use of more complicated procedures and in simplifying the complicated procedures.

Aside from lack of knowledge of complex procedures, laymen have a problem in economic choice. If the use of refined and complex procedures increases the accuracy of estimate only slightly, the additional cost in time and effort may exceed the value of its contribution.

Assume that an individual operator knows his yield per acre, price of product, and his variable and fixed costs per acre. As shown in the diagram, he can then calculate the average cost per unit of product at that yield. If he knew marginal and average costs for a range in output, he would equate marginal cost and marginal revenue (equal to price of product) and produce at output o-e. At this output, according to the usual explanation, return to fixed factors would be b-c per unit of product, or a per acre total of a-b-c-d. Return to variable inputs would be b-e per unit of product, for a total per acre of o-e-b-a.

But this operator produces at a level of o-f, because of capital rationing, lack of knowledge of production response, uncertainty, and risk aversion. At this output, he knows, his average variable cost per unit of product is f-h and his fixed cost per unit of product is h-j. Gross returns are f-i per unit of product and $(f-i)(o-f)$ per acre. What can be said about the problem of distributing total output between fixed and variable inputs?

There is no apriori condition to specify that the rate of earning on fixed costs equals the rate of earning on variable costs when marginal costs equal marginal returns and marginal returns equal price of product. Yet, if the firm is actually at its highest profit combination, the rates of earning on dollars invested in all resources must be the same. Otherwise, income could be increased by shifts between inputs. For this reason, it is apparent that for all cases except firm and industry equilibrium (that is, general equilibrium), limits must be added to the statement that "equating marginal costs and marginal returns will define the highest profit combination." A preferable wording is that equating marginal costs with marginal returns will determine



the most profitable output for the given fixed resources in the firm. Given the fixed costs for a production period, income is a maximum for that period when marginal costs and marginal returns are equated. Only if total unit costs are equal to price of product and marginal costs equal marginal revenue will the rate of return on investment in all factors be the same and the highest profit combination be achieved.

The orthodox argument advanced to explain that returns to variables must equal their cost (in diagram, shown by e-b equal eb per unit of product) is that this return is required to hold them in the firm. Here the difference between short and long run must be noted. Resources will be shifted between firms - between production periods - if they do not earn rewards comparable to what can be earned in other firms. But this is an ex post determination. The decision to invest resources is ex ante. Resources are invested where they have promise of earnings at least equal to their estimated marginal value products. Once invested in a firm, however, the possible or estimated marginal value product in another firm or another industry does not constitute a defensible basis for allocating total product. Instead, some within-firm conditions are appropriate, because what the factor actually earns is determined by relations within the firm - particularly by the kinds and quantities of other inputs with which it is combined in production. There is a significant difference between charging factors to the firm at costs determined by opportunity cost, and allocating returns on the basis of opportunity marginal value products.

At output o-e, marginal costs equal marginal returns. Variable costs are covered by receiving a payment of e-b; and fixed costs are covered by receiving a payment of b-1. The amount 1-c per unit of product is above total costs; it is profit per unit of product. Within this firm, the inputs of both variable (e-b) and fixed (b-1) resources contributed to the profit. Logically, therefore, both variable and fixed inputs should share the reward - particularly in the typical farm firm in which the owner is manager and performs the major part of the labor. If not, then the fact of firm profit as such has a peculiar effect on estimated earnings of fixed factors. 6/

Allocating to the fixed factors all returns above variable cost per unit of product overestimates the contribution of fixed factors - particularly land, in the farm firm, because land makes up the major part of total fixed costs.

6/ Admittedly, profits as such accrue to resource owners in the firm. The argument here is not directed to the point of paying hired labor a bonus above contract wages, simply because the firm has a profit.

The same argument applies in case the total cost of product is above the product price. Not all of the loss can be attributed to the fixed factors. Possibly, the discussions to the contrary in the literature result from theorists dealing mainly with firms in which labor is the major cost and all labor is hired at some specified wage rate, as well as from the tacit assumptions of long-run and of equilibrium.

The recommendation is often made that land earnings may be estimated in an area by using landlord net returns on rented farms. According to economic logic, this estimate is in error. Landlords make outlays for variables such as fertilizer and seed, and the net landlord return is calculated by simply subtracting all landlord costs from landlord gross returns. For this reason, it seems doubtful that the ease and simplicity of such calculation justifies the faith put in it. Land earnings are overestimated thereby. A closer estimate, logically more realistic, is made by attributing landlord total returns to both land and variable inputs at the same rate of return.

Therefore, for the farm operated with limited capital, neither e-b nor f-h can be taken as a realistic estimate of the earnings of variables. These are costs, not earnings of the variables. Nor can b-c or h-i be taken as an estimate of earnings of fixed resources. But at either level of output, costs can be covered by allocating a return to them. Then, the profit per unit (1-c or j-i) can be allocated to both variable and fixed inputs. Divide total cost per unit into price per unit of product and thus calculate a rate of return per dollar. Multiply this rate of earning by the fixed cost, and thus obtain an estimate of the contribution of fixed inputs to value of output. The assumption of an equal rate of earning on all inputs may be a closer approximation of the actual earnings of factors than is any other assumption or method of calculation available to the operator, considering the information available from which he can estimate factor earnings.

Any procedure for calculating earnings of factors requires pricing all the inputs, and charging them at some cost to the firm. ^{7/} Some inputs have dollar costs per year in no debatable terms. A ton of fertilizer bought and used, or a month of hired labor, requires a specific dollar outlay. Annual factor pricing is less cut and dried for such inputs as machinery or equipment, which last for a period of years. But these too have a dollar price tag attached to them in one way or another. For these items, there are questions of amount of charge per year; but depreciation, amortization, and even estimates of sale value provide usable guides. The more difficult factor-pricing problems are (1) for inputs made in physical terms that do not involve a specific money outlay - operator labor; and (2) such durable factors as buildings and improvements, and particularly land.

^{7/} The only exception is the use of residual for one factor.

Take first the pricing of operator labor and management inputs. These have costs, even though they do not have specific dollar outlays. The concept of opportunity cost suggests the procedure for making the annual charge. Labor of the operator and that of equivalent by the family can be charged at rates prevailing in the community for the various kinds of work and workers. The operator could sell his labor to another firm; and the wage he could have received is his labor-opportunity cost.

The opportunity cost for the management input is only slightly more involved. Rates are charged by commercial farm management organizations. The operator would have to pay such a rate if he hired the service. The management charge by these organizations is a percentage of gross - which automatically takes quality of management into account, because quality of management and gross returns are correlated. This procedure would define as quality management all the correct decisions actually made in fright, under fortuitous circumstance, and with luck. But it would also avoid the probably greater evil of charging all management to all firms at a flat price.

Applying the opportunity cost concept to land as a factor requires estimating the current market value for the given land. The accuracy of this estimate may be questioned because the classification data needed to permit comparison of the quality of the one tract with that of farms actually sold may be lacking. The number of sales may be small, and farms are sold as composite packages. Nonetheless, people do formulate estimates of probable sale value, and these estimates are one of the few available indicators. Also pricing the land input, specifically and consciously, may in itself cause greater attention to be given to the cost of the land input.

Admittedly, the value of the land input is the point at issue. If its price or cost can be determined by looking at the market, what is the purpose in calculating a land earning? Why estimate price of land to calculate earnings of land, and then to calculate land value? Is this not circular reasoning?

This apparent circularity applies to all factors. Returns to all factors are functions of their costs in that prices affect the quantities used and the quantities used determine marginal products. Use of the estimated market value of land is a trial run - a part of calculation procedure - a step in the analysis process, to test the consequence of that price for land. Given the estimate of market price for land, and other prices and cost relations, the evaluator can decide, by allocating returns, whether or not to buy or sell at the estimated market price.

TRANSLATING FLOW OF RETURNS INTO FUND OF VALUE

Estimating earnings of factors for one production period, as discussed in the preceding section, is a static concept. The manipulation is performed in an on-going process. Prices and costs change from year to year. Production from the same set of capital inputs and management practices varies from year to year because of weather and other organic relations. Some of the inputs are not exhausted in one production period. Some have effect over several years. Some, as land, last indefinitely, if maintained. Technology changes.

Estimating the flow of costs and returns through time, to determine the present value of future returns, is a problem of making reasonable estimates. The theoretical framework stating the necessary conditions is sufficient. The difficulty comes in application. The uncertainties, lack of predicting procedures, and unknowns as such, as well as the assumptions implicit in the theoretical model have cast doubt on the efficacy of the model. Possibly the best that can be done is to formulate some general rules, devise some approximating procedures, and indicate some of the thought connections between the theory model and the problems of valuation.

Price expectations - The body of thought dealing with the ways in which estimates of future prices are made is not well developed. Yet, necessity demands that resource owners make decisions in the present in the face of unknowns of the future.

Distinction must be made between expectation as to the price of a given item at some date in the future and expectation as to production as conditioned by lack of knowledge of production functions. The former is the point of concern here. The latter is more subject to individual control in that the number and kinds of capital inputs are a matter of decision; yield or production response to given practices (factor combinations) can be determined empirically - in general, at least, to the point of reducing an uncertainty to a calculable risk, even though temperature and rainfall cannot be predicted with accuracy for the given year.

The conceptual framework for handling price expectations in the dynamic environment of the firm operating under competition is an extension of static theory. The transitional device is that of designating an input or an output at different points of time as different factors or different products, and substituting discounted prices for actual prices. 8/

8/ See Hicks, J. R., Value and Capital, Oxford, 1939, ch. 16, and Lange, Oscar, Price Flexibility and Employment, Principia Press, Bloomington, Ind., 1944, chs. 5 and 6.

In general, application of this framework to the farm as a firm is the same as that to other firms, but in farming, the organic nature of the production processes increases the variation in production that affects product prices. A drought in the winter wheat area, for example, changes the whole supply situation for this type of wheat and the rate of substitution of one kind of wheat for another - thus affecting price expectations for wheat in the short run. But supposedly decision-makers in wheat farm firms still formulate their expectations from present and past price relationships. Price expectation and price uncertainty emphasize the significance of the relation between product pricing and factor pricing. The product price of the future, discounted to date, helps to determine the scale of operation and the combination of factors in the present. Factor value is thus a function of expectation.

In formulating their estimates of future product prices, decision-makers in the firm are in essence making an estimate of the market demand schedule for the product at some future date. The estimate of demand for the particular good or service is influenced by cross elasticities of demand, because the marginal rate of substitution of one product for another is affected by changes in relative prices. For example, if there is a short corn crop in a year of average or above-average wheat production (or supply, to take carryover into account) the price of corn changes less than it would otherwise, if wheat were not available for stock feed. ^{9/} Therefore, in planning his production and his combination of enterprises, the decision-maker estimates the slopes of the demand curves for selected products in the future as compared with the present. Similarly, the supply schedules are visualized for the several products the firm produces or may produce. Even though in his thought processes the individual merely "looks" at the present or past price of wheat, and guesses that it may be higher (or lower) next year, actually he is hypothesizing a demand situation that he compares with a supply situation to formulate his idea about the future price of the product as compared with the present price.

Expectations as to product prices apply to the revenue side of the ledger in determining the kind and level of output. Similar sets of expectations apply to costs of inputs. Future costs of such variable inputs as fertilizer or machinery can be analyzed with the same theoretical tools. The firm buys the unit of input in an established market - gasoline, oil, fertilizer, insecticides, machines, tools, hired labor, and livestock. For variable factors, the choice is based on the marginal rate of substitution of factor for factor in a time setting, and the relative marginal rates of transformation of factor to product. Apparently, this is the basis of choice expressed in recent years, with the substitution of machinery for labor. Farm operators bought machinery at

^{9/} See Weintraub, Sidney, Price Theory, New York, 1949, pp. 48-49.

increasing prices to replace labor which in their opinion was relatively more expensive and for which there was prospect of a further increase in price.

The analytical framework for decisions as to kinds and amounts of variable factors is the same within as between planning periods. Because prices of factors are expected to change, purchases are shifted between planning periods, to combine with given amounts and kinds of the fixed factors. Also, differences in expectations as to rates of change in factor prices compared with product prices influence the level of output and the timing of sales. Still, all of these as expectations fall into the same general category as related to the production process, in which variable inputs are applied to fixed factors, even though the quantities of fixed factors may be changed between, but not within, planning periods. Also, the planning period may not be the same for all enterprises within the firm.

Theory offers few guides to decision-makers in firms, in the sense of furnishing a blueprint or formula in which given values may be substituted, to help them arrive at prices or costs. Rather, it provides the rationale and specifies the relevant facets to be considered. Furthermore, price expectations as such are conditioned and modified by willingness to assume risk, by capital position, liquidity preference and time preference, as well as by the beliefs and value judgments of the individual operating within his opportunity horizon.

Risk and uncertainty. - Risk is a calculated allowance for variation in an outcome, the range of which is known. The probability of the outcome can be established. Risk is a calculated chance known in advance; conceptually, it amounts to a probability distribution. Uncertainty refers to a future event, the probability of which cannot be predicted. The probability distribution is unknown; it cannot be determined empirically. To illustrate: Variation in the yields of wheat in Ward County, N. Dak., has been established empirically and the chances of loss or gain are a known risk faced by producers each year; but the yield in a given year and the price to be received for wheat in the next year or 5 years hence cannot be predicted with certainty. Risk can be reduced to a cost and is insurable, whereas uncertainty is not insurable. Although economists disagree as to the technical details of risk and uncertainty in the theory of production (and the terms applied to explain the same ideas vary), there appears to be agreement as to the effects on the firm. But there is no

agreement as to the method of taking risk and uncertainty into account in the planning process so that predictions will approach perfection. 10/

Added to the effect of risk and uncertainty on the way in which the decision-maker in the firm views the future is the effect of both the willingness and the ability of the resource owner to take risk and to act in the face of uncertainty. Willingness and ability to bear risk may be a prime determinant of choice of enterprises; thus it affects the flow of income attributable to the fixed factors in the firm.

Here again, distinction must be made between willingness or ability as conditioning forces and lack of knowledge of opportunity or lack of mobility of factors. Farm operators seldom move far from the geographic areas in which they were reared. Many historical exceptions can be named, such as the settlement of the American frontier before 1920, current colonization by displaced persons, and mass movement of specific religious or other groups from one part of a country to another or from one country to another, but these instances do not deny the generalization. In entering farming within a local area, no account may consciously be taken of risk differences between areas. In fact, the only known opportunity may lie within the local area. The opportunity may take the form of resources made available by gift or transfer from father to son, the taking over of the family farm, the capital value of which is not open to long-distance transfer. These instances of resource fixity and lack of knowledge cannot be included in the treatment of risk and uncertainty as such.

Within the local area and between areas, capital position influences the decisions that are made on investment in and combinations of factors. An operator (tenant or owner) with limited cash reserves cannot afford to chance a venture that involves high risk. He may thereby lose possession of his total capital accumulation. His choice, therefore, is of enterprises that promise return with certainty. Or, an operator with adequate capital reserves may

10/ Among others, see (1) Lange, O., *Price Flexibility and Unemployment*, Bloomington, 1944; (2) Hicks, J. R., *Value and Capital*, 1939, op.cit.; (3) Shackle, G. L. S., *Expectations in Economics*, Cambridge, 1949; (4) Stigler, G., *Theory of Price*, 1947, op.cit.; (5) Tintner, G., *A Contribution to the Non-Static Theory of Production*, in *Studies in Mathematical Economics and Econometrica*, Chicago, 1942, pp. 106-107; (6) Hart, A. G., *Anticipations, Uncertainty and Dynamic Planning*, Chicago, 1948; (7) Heady, E. O., *Economics of Agricultural Production and Resource Use*, 1952, op.cit., chs. 17-18; (8) Knight, F. H., *Risk, Uncertainty and Profit*, London School Reprints of Scarce Works, No. 16 (1933).

prefer to accept a fairly certain but low rate of return rather than to choose an enterprise in which there is possibility of a high profit or a loss. For example, one individual may not buy a carload of feeder steers because he cannot afford to take the loss that might be involved. Another may choose to invest in dairy cows because he would rather have a steady though lesser flow of income from them than a possible larger income from feeders, and he could afford the risk. Possibly, too, he prefers the docility in the eye of a placid Jersey cow to the lively interest in the eye of a steer raised on the range. These conscious choices, whether from preference or ability, or both, help to determine the product; and the sale of the product sets up the flow of income that is discounted to determine the value of the fixed factor.

Risk and uncertainty are major determinants of choice of products and level of output. The level of output, as set by the combinations of inputs and variables, and the given prices of the product determine the size of the flow of income and the earnings of the fixed factors. The rate of discount applied to the flow of net return to the factor determines the amount that can be paid for the factor.

Income flow and fund of value. - The several different formulas for translating the estimated flow of income into a fund of present value are varieties of the simple division of income by a rate of discount. In its simplest form, current value is a constant annual earning of land divided by a discount rate. Mathematically, this simple formula is the same concept as the more complicated expression in which present value is the sum of the varying incomes per year, each discounted to the present date. A complete expression of the calculation process would show the estimated income for each year, from the first year to that distant year in which the future income is so far removed from the present that its present value approaches zero. Time beyond 50 to 60 years, depending upon the rate of discount, has little effect on the fund of present value. The discounted value of a dollar due 60 years hence is only a few cents; therefore, income per year in that distant period would need to change greatly to affect significantly the present value of land. 11/

To the firm operator, it is the incomes during the first few years that are of most importance, because these incomes have greater effect on the fund of value than those of later years. Therefore, it seems advisable to estimate the future income for each individual year for the first few years, then to assume an average below which income per year is not expected to drop. For example, income per acre is estimated at \$20 in the first year, and at

11/ For detail on the discounting and its mathematics, see any good college algebra text.

\$15 in the second and fifth years, to take account of a period of fairly high-income years. Then, because farm income is expected to drop slightly, the income for the 6th through the 10th year might be estimated at \$12 per acre, and from the 11th year into the future at \$10 per acre. Taking the \$10 as a base and dividing by a discount rate gives a usable base value. Adding the discounted values of the first 10 years to this base value gives the present value. This idea might be illustrated with values for individual years, or to show the effect of a period of low income in the near or distant future. The process of calculation is the same, regardless of the amount or the sequence of flow of income. 12/

In practice, the more common discount rate is taken as the average going rate of interest on farm mortgages. This serves the purpose for general application, as an expression of what the average operator might be willing to take as a rate of return on money invested in land. It serves for such general purposes as determining the level of loan value over wide areas, for companies making farm mortgages. It serves also as a guide to the individual in estimating an average sale price he might expect at some date in the future. It does not offer sufficient guide for decision as to the actual factor price or indicate the individual's time preference. A more relevant guide to determine the rate of discount to be used by the firm-operator in deciding how much to pay for land is his own estimate of the income-earning opportunity within the firm. He can invest in land profitably up to the price per acre at which the expected rate of return is the same as that on money invested in other factors.

The rate of interest on farm mortgages can serve as a standard of comparison. Using that rate gives a fund of value from which he can depart, in the sense that he feels he can act with certainty on the assumption that a buyer would be willing to pay this amount per acre, or that he would be able to obtain a loan for a fraction of this capital value by mortgaging his land. His willingness to accept a given rate of return tells him how far he can depart from this average or standard of comparison.

Comparisons of possible rates of return on investment in all factors in the going concern are essential in deciding on a current price for land. In terms of opportunity, the marginal efficiency of capital invested in expanding the hog enterprise might exceed the estimated rate of return on additional investment in land. Obviously, the operator could not afford to buy land with his limited available capital, at the expense of foregoing the income opportunity on hogs. But if the hog enterprise could be expanded only by adding land, then the relevant comparison is the estimated contribution of the long-term

12/ The process of calculation is illustrated in Buying of Farms in Story County, Iowa, 1940-48, Iowa Agr. Expt. Sta. Res. Bul. 377, pp. 1004-1009

return on added land versus the short-term return on hogs. Land as the limited factor would be given an imputed income which would reflect the high income-earning opportunity on hogs in the short run. The operator would try to divide his investment in additional land and additional hogs to equalize the rates of net return to both. He might also choose rationally to invest only in additional land at a prospective rate of return of, say, 5 percent over an expected period of, say, 20 years, in preference to investing in hogs at a prospective return of 20 percent over a period of 5 years.

In practice, decisions of this kind would necessitate a specific comparison between the price he knows he would have to pay for land (as determined in the local land market) with the price he calculates he could afford to pay, on the basis of estimated land earnings divided by his rate of discount. The price he would be obliged to pay to obtain title compared with the amount of income he estimates the land will return gives an expected rate of return that he can compare with the subjective rate of return he is willing to accept.

Within the firm, both the discount rate and the estimates of return to land per year are subjective. The operator of the firm makes decisions regarding them in terms of the purposes he wishes to accomplish and in terms of his abilities as compared with some concept of what might be expected under an average level of management in the community. The discount rate, particularly, is an expression of what a decision-maker is willing to do. By way of example, preference for farming as an occupation and desire to live in a given area and produce given sets of commodities may and do take the form of willingness to accept a low rate of return on investment. This results in a low rate of discount, and a high price for land. Here, maximization of dollar income is not the relevant goal for the individual. But for survival of the individual and the firm, the calculations and decisions must be related enough to reality in income probability (reasonable expectations) to provide an income sufficient to allow the firm to continue operations. The subjective discount cannot be so far below the rate of interest on farm mortgages that the resulting price of land demands a schedule of payments that cannot be met from available income sources.

In effect, the same result is obtained by attributing a psychic income to personal satisfactions and using a higher rate of discount. The same present value of land can be determined by either method of calculation. This estimation of psychic income is sometimes presented as superior to using a lower rate of discount, on the grounds that any discount applies to psychic as well as to real income. True, the psychic income may be realized whether or not there is a real income, and the higher factor price that results from discounting psychic income may thus be justified. But this argument overlooks the fact that the discount rate is subjective, and is *ex ante*. Money is invested in land today, to earn over a period of years. The present value of

this future income is determined by the rate of discount one is willing to take. The flow of real income must be high enough to cover such annual land costs as taxes, interest on mortgage, and amortization payments.

The discounting of future revenues accomplishes the same result as does the compounding of present expenditures (capital inputs) and a flow of expenditures over a period of years. In this process, the purpose is to make realistic estimates of the cost of obtaining a revenue at a future date - for example, the inputs over a period of say 10 years to bring an orchard into production. This is a problem in equating marginal costs and marginal revenue over time. The necessity for charging interest on interest as a measure of cost, when inputs over a period of years are essential to the production process, arises from the fact that the dollar input of the first year stays invested for a period of years; the opportunity foregone by not using the alternative of investing that dollar in interest-earning opportunity is a real cost; the interest earned during the first year could have been reinvested in income-earning opportunity.

The calculation of future net revenues is more specific if account is taken of the instances of succeeding inputs over a period of years. The reason for devoting in economic literature relatively more attention to income discounting than to cost compounding probably is because of the fact that by far the greater number of inputs earn their reward and are exhausted in one time period and therefore these costs are not compounded. 13/

Again, theory provides the rationale for analysis of the problem of translating the flow of income into a fund of value. The fact that decisions regarding relations are subjective is only a characteristic of the economic environment, not a condemnation of the theory.

Management decisions are made by farm operators in an environment in which wide variations in estimates for one factor for one year may have surprisingly little effect on the outcome for that one year. The outcome of a decision made in the current year may not have incidence until several years have passed. Decisions are made in the short run, and people live in the short run. But the serious problems of economics result from relations between time periods. Change is of the essence. Differences between rates of change cause continuous problems of adjusting to change in the economic environment.

13/ For a convenient and fuller discussion of discounting and compounding, see Heady, E. O., op.cit., especially chapters 13 and 19.

A few examples will help to illustrate the nature of the calculation problems, by showing some of the complexities. One is the consequence of pricing given factors - particularly those durable ones that span a period of years. On the basis of annual cost of land, the land price for an individual farm can vary widely before the effect per year changes significantly the proportion that the annual land cost is of the total production cost in the firm. The annual cost of land is only a small percentage of the present factor price. Land is purchased for, say, \$500 per acre. At 6 percent, the annual cost of the land input is \$30 per acre. Changing the purchase price by \$100 per acre changes the annual land cost only \$6 per acre. In the operating firm, land cost per acre is only one of the annual costs. Changing this one cost changes total costs by a smaller percentage.

For going-concern farms, this may mean that only the heavily indebted operator who must make payments on his mortgage runs into difficulty when, because of the incidence of land cost as such, farm income drops to the level of annual costs of family living. A debt-free operator does not have the problem of specific money payments on land to be made from farm income.

In dollar terms, however, the capital-requirement aspect multiplies, and probably in greater proportion than the range in the price of land. This comes about because of the operation of the credit market and the institutionalized requirement of collateral for loans. A buyer must commit himself as of now for the full purchase price. He must have capital to make the deal. Downpayments are usually substantial. In short, to acquire use of land through ownership at an annual cost of \$30 per acre requires an outlay or investment of \$500 per acre. If the operator is short on capital he may have to sacrifice in both operating capital and family living.

The significance of investment in land, therefore, is in the impact it has on use of limited funds. The problem the operator faces is to make his limited number of dollars earn at the highest possible rate within the range of opportunities that are available to him. Pricing and acquiring land at a level above its earning capacity thus moves the firm away from its income-maximizing combination, because dollars are tied up in land when they might be earning a higher rate of return in fertilizer.

On the demand side, the area of choice available to the individual may be such that he has no higher alternative opportunity. Leasing may be impossible. The only choice is to buy land at the market price, if the operator is to continue farming. But even so, careful analysis of relations between earnings of factors within one production period and the flow of returns over time at least begins to come to grips with the problem. The decision-maker thereby becomes aware of some of the costs involved, and his study of relations may direct his efforts to other endeavors.

The real task in dealing with the multiple-product firm and estimating future returns lies in: (1) Determining the earnings of each factor for one production period; (2) making some estimate of returns in subsequent years; (3) choosing the discount rate, to obtain present value of future earnings; and (4) deciding how to handle innovations. In this process, the fact that inputs do not have the same productive life is incidental and confounding. In essence, the production period becomes the unit of division and addition, because the combination of factors changes between production periods. The operating firm's actions are spread over several production periods, with groupings comparable to the life period of sets of inputs, and this grouping changes each year. On an annual basis, however, account must be taken of all costs each year; and each of these costs contributes to the earnings for that year.

In general, future prices are usually taken by assumption. These assumptions may extend the present trend, extend present values, or allow for change in trend. The sum of discounted future values thus becomes an estimate. In view of the impossibility of determining with any degree of presently measurable accuracy a price of wheat (for example) 50 years hence, possibly the best estimate is some longtime average price. A dollar due in 50 years is worth only 8.7 cents today at 5 percent discount, and 5.4 cents at 6 percent discount. In practical terms, use of the capitalization procedure may reduce to making an estimate of long-time average earnings (dollars) on land per year and dividing by the operator's subjective rate of discount.

Capital formation. - The relation between capital formation and factor pricing revolves around the effect of inputs that change the capacity of the factor. Here, it must be remembered that factors change between production periods, and factors can be defined meaningfully only within grades of a more general category. Land, labor, management, machinery, fertilizer, weed spray, and gasoline are constant in quality only in the short run - perhaps for no more than a year or for one production period. If land absorbs inputs that have a lasting effect and are inseparable once applied, it is not the same factor as before. It follows that if the quality of land is thus increased (or decreased), the flow of factor services changes, and the value of the product attributable to land changes also.

Inputs in land are capital forming if the slope of the production function at a given input is increased. The difference between an input that is and one that is not capital-forming is that the capital-forming input takes on a fixity and becomes practicably inseparable from the land. Land productivity is increased; it changes in quality, and takes on a new ratio of output to variable input. Non-capital-forming inputs merely move along the same production function. Obviously, inputs can also decrease output and be capital depleting. Also, lack of upkeep, erosion losses and the like, are capital depleting, in the same way that destruction of property by fire or flood is capital depleting.

Labor and other inputs that are nonmonetary are as capital forming as though they required dollar inputs in a production period or over a number of periods. The problem is one of putting reasonable price labels on these inputs, to determine the costs of input. As for all other inputs, the basic question is whether the advantage gained will be worth the effort expended. Again, the opportunity-cost concept may be the only usable guide. There will be instances in which the opportunity costs for both individual and factor approach zero.

This does not imply that the classical theory of value is particularly pertinent to factor valuation, or that all the labor that has been absorbed by land since it was subjected to property right must be accounted for. True, the present capacity of the land is traceable in part to the labor it has absorbed through clearing, drainage, and the like. Instead, the problem centers on taking the land as it is today, in terms of what it will produce under a given set of operation practices, and then asking what it will produce if capital-forming inputs are added.

Inflation in one or several prices complicates the analysis of earnings of factors and of capital formation. Effects of changes in the purchasing power of money can be handled analytically by converting values into constant dollars. This removes the effect of change and makes possible the comparisons through time. But it does not remove the incidence of inflation or the effect of increasing factor prices on problems of capital accumulation or getting started in farming.

One recurring question is whether land prices are inflated. This question is pertinent to the decisions people make. Decisions to buy at current land prices may hinge on buyer estimates of the rate of change in land prices compared with other prices. Purchase of land is used as a hedge against inflation. As related to the problems of factor pricing, however, the relation between inflation and capital formation may be more important than that between movement of land prices compared with other prices - if for no other reason than the fact that only a portion of all farm properties are bought or sold in a year, whereas all properties present their owners each year with questions of whether to make capital-forming inputs.

Absence of an acceptable general theory of capital growth, and the divergence of views on capital formation leave unexplained many facets of the phenomena in agriculture as an industry. But capital formation must be taken into account in the theory of factor pricing. This must be done particularly to (1) distinguish between outputs resulting from movement along a given production function and those involving a new function; (2) analyze alternative return possibilities, choosing between increasing the output of the firm by capital formation activities that increase total output in the industry, and

transfer of resources between firms, which may increase the output of one firm merely by decreasing that of another; and (3) distinguish between effects of capital formation and those of inflation.

Current production theory has not designated as "theory of economic growth" many of its propositions and terminologies which by definition would be considered within the concept of capital formation. But as the whole body of production theory is viewed in perspective, many of the relevant facets can be seen. These appear under discussions of determination of factor combinations, equation of factor productivities between time periods, and possibly size of firm. That is, a theory of capital formation is almost implicit in the economics of the firm, but it needs to be made explicit.

DISTINGUISHING BETWEEN FIRM AND FAMILY EXPENDITURES AND RETURNS

Production theory along with its usual assumptions does not offer a large enough framework to guide the actions of the individual in his land-pricing decisions, or to guide research on problems of land pricing. There is also need for a method of analysis by which the relations between production and other phenomena can be appraised. One requirement in pricing farmland as a factor is the recognition and treatment as variables of customs, institutional forces, law, value judgments and intangibles, just as livestock, bushels, dollars, or time are treated as variables. Effective research also requires the isolation of value judgments associated with owner-operatorship, with ownership per se, and with agricultural fundamentalism. These variables too have incidence on decision making and are intricately related to production activities.

Production theory separates the firm from the household. In practice, the two are combined in the family farm. The analytical problem is to demonstrate that even though the farm and the home are one as an organization entity, both can benefit by subjection to economic analysis that attempts to separate the production from the consumption functions. Unfortunately, economic analyses as applied often combine the functions and make no distinctions between them. For example, a number of research and extension publications advise tenants and landlords to balance the value of the family residence against some item of equal value on the production side. The residence is household, not firm.

Inclusion of discussion of firm-household relations in a statement on factor pricing does not mean that theory of value must encompass theory of household and family. Rather, the situation requires recognition of the need

for exploring relations between the two, so that rational choices can be made in areas of decision that affect both at the same time. Use of farm-family income is an example. What are the choice indicators in deciding between "living it up" and investing in the farm business?

Choices among uses of farm income and decisions for family consumption versus production expenditures have incidence, both directly and indirectly, on factor pricing. One is that the farm as a real estate entity usually includes a family residence as part of the property. If the residence does not meet the needs and tastes of the family, there is always the question of whether to use limited family income to improve or rebuild, or to select another farm. Also, family living expenses compete with farm operating expenses, and thus level of family living may be one of the determinants of intensity of farming operation. Level of family living and the time incidence of such significant family expenditures as unusual medical expenses or keeping sons or daughters in college compete with capital-forming investments. If the family exercises first claim on farm income, the funds available for production investments may suffer.

Theory of the firm as such disposes of the problem by assumption. It takes the quantity of resources available for production as a given quantity. The relevant choice indicator for use of these funds is maximum returns. But the household has another goal. It is to maximize satisfactions. This goal may run counter to the achievement of the firm's goal.

Even though the family and the firm may have conflicting goals, decisions as to their achievement are subject to the same analytical procedures. Logical choice rests in the comparison of increments of costs and increments of return between alternatives, for both.

Marginal analysis as an analytical device - and not alone as the usual concept limited to economic theory - has a universal application as a choice indicator. As an analytical device, it can be applied to choices between non-economic and intangible values. This assumes that even intangibles can be placed in ordinal array, or that people can establish the order of their preferences, if they choose. An individual has an indifference surface at one point of time, but it changes through time. Somewhere along the line of their choice making, people compare tangible with intangible values. In doing so, they establish for themselves dollar values on the intangibles. The choice may be in terms of the amount they are willing to pay or of something they are willing to forego. Admittedly, these choices are subjective.

Part of the conclusions as to the utility of marginal analysis stems directly from thinking of it as a theoretical abstraction rather than as an analytical device. Posed as a systematic procedure for comparing increments of cost with the associated return, the possibilities are unlimited. Solutions to thousands of everyday decisions involve application of marginal analysis - the comparison of increments of input with those of return.

Choice between family consumption and firm production expenditures becomes critical for both when available resources are insufficient to provide an acceptable family income. Then, the most careful analysis cannot sufficiently increase the returns from the available resources. However, analysis may result in the conclusion to enter another occupation, to add more resources by leasing, and the like. These too are economic problems that are subject to marginal analysis, despite the difficulties of measurement.

For the groups of farms for which income usually exceeds family living requirements, decisions between family and firm expenditures seldom spell sacrifices for the family or undue restrictions for the firm. But subjecting some of the choices to careful analysis may result in added advantages. Possibly, the postponement of a family activity this year, and the use of the funds in the firm can mean a larger or greater family achievement next year. These are problems in choice and in timing that the more fortunate have opportunity to make.

The cost of owning land may be in terms of sacrifices made by the family - in opportunities foregone, or in level of living that is possible from the income the farm will produce. Production theory assumes quantities of resources available for production. For the specific problem of factor pricing, one proceeds with the land valuation problem separately, taking required production inputs and estimating the outputs. But, decision as to whether to make the purchase or sale may involve considerations and analysis of family problems. If the benefit in ownership is status and income lower than in available alternatives, the benefit may not be worth the cost, when all costs are included.

This discussion suggests some of the pertinent types of analysis and instances of family-firm relations. Those mentioned deal with the demand side of the equation (situation). Theory of production is a theory of factor demand. Equally as important, but far less developed, is the theory of factor supply, and decisions here are also affected by family-firm relations.

EVALUATING NONMONETARY PHENOMENA

Obviously, amenities, intangibles, and personal preference facets associated with given tracts of land or with specific geographic areas cannot be classed as production characteristics. They are consumption characteristics. They do contribute to personal satisfactions, and only so far as personal satisfactions contribute to the output of the firm can they be looked upon as a part of the production capacity of land. By and large, these characteristics exist in addition to the land's capacity to produce a given product that requires input of capital and labor. The values may be socially created, or they may be natural features. But they have want-satisfying power only to the person who has a preference for them.

On the demand side, the limit to the price to be paid for these characteristics rests in the preference scale of the individual, and on the supply side, in what traffic will bear. Many amenity values do have a market value. People formulate their estimates in terms of their own scales of preferences, and they do place dollar values on them. There is no recognized economic doctrine by which dollar value can be decided for the individual, for it is a matter of taste. But there is an economic rationale by which the individual can compare the outlay needed to satisfy his preference with the return expected from it.

Income-producing capacity can be estimated. If the seller's holding price exceeds the sum of the discounted future returns because of the known existence of amenity value, at least the buyer then knows how much he must pay for the amenity value. If the value cannot be paid, even by accepting a low return on investment in land and by sacrificing elsewhere in family level of living, the cost may be deemed to be too great. This type of analysis puts the valuation of amenities into the opportunity-cost framework by pointing up the consequences of particular decisions and isolating them from production aspects. No body of theory can expect to specify the values for personal preference. But analysis may begin to indicate some of the consequences; and the process of subjecting the amenity to consequence analysis may determine limits to choice.

One need not trace through or try to understand the source or cause of the preference between values, unless such understanding is incidental to an educational process in which expressed social determinations have taken the form of specific educational programs to change the sets of ideas held by given groups. Nor need one delve into governmental organization, through which social control denies such satisfaction as taking a life, except in self defense, or in war. Instead, the social structure at any one point of time is taken as given, even though little may be known about relations between some

of its parts, with the knowledge that individual and group goals are subject to change and that some goals change at a faster or slower rate than others.

An individual makes his decisions regarding factor pricing in the environment of the firm in a framework that is influenced significantly by his own set of tastes, as well as by the quantity of resources he controls. One limitation to maximizing income in the firm is that of the limited quantity of resources and the low level of income from these scarce resources. Scarcity shapes the choice of use of given quantities of dollar income between present consumer expenditure and firm investments. Here the function of a larger income that is realizable by investment in either fixed or variable factors in the firm may run counter to the time preference of the firm operator and members of his family. Specifically then, firm income is not maximized because current requirements for family consumption expenditures have a higher rating in the scale of ends. Nonetheless, the choice can be made and possible higher levels of satisfaction for both goals can be attained, if the rigor of the income-earning analysis is followed through. The sudden desire for a new car, prompted by the fact that the neighbors have a new one, might be stopped short of action if reinvestment of \$2,000 in the firm can be shown (on paper) to mean the possibility of a higher priced car a few years later. Or, if the family has been doing without conveniences to increase investment in the firm, possibly a careful comparison of the levels of satisfaction at different points of time might divert expenditure to consumption. The existence of these and other multiple-choice opportunities does not deny the necessity of analysis to find the most suitable balance between expenditures for investment and those for consumption.

Differences in purposes or values to be maximized through the firm as a firm and the operating unit as a household cause choices to be made in use of resources so that the firm is operated at less than the highest profit combination. Preferences for security, unwillingness to bear risk, and desire for leisure instead of additional income have the same effect. The wish to live in communities with neighbors of similar sets of beliefs, to send children to schools of established reputation, to be located on a hard-surfaced road, and a host of other preferences cause capital resources to be invested and to remain invested in chosen geographic and cultural areas, even though alternatives with higher income-earning opportunities are known to be available. Indifference analysis provides the framework in which conflicting values may be studied and presents a connecting link between tangible and intangible values.

SUMMARY

In practice, land is evaluated, priced, and transferred as part of a real estate bundle. This discussion is limited to the land component of the bundle, with emphasis on economic rationale. It looks for thought guides to decision making, rather than for an explanation of the operation of the land market or of the relation between land and other parts of the farm real estate market.

Much that is said here concerning the pricing of farmland applies as well to other component parts of the real estate bundle. In particular, any durable physical part, such as a building that contributes directly to production - whether housing for livestock or storage facility for grain sold on the market or through a livestock enterprise - is amenable to treatment as an income-earning factor. Its present value is the summation of the discounted future earnings. Also, for other parts of the bundle, the value of the direct want-satisfying characteristics associated with or in addition to any specific income-producing capacity is a function of individual preferences and choice can be made within the framework of available alternatives.

The capitalization concept is a thought guide to action (decision). It is a rationale, which specifies relations between variables and within which judgments can be made. The problems in its use center on and result from lack of information, not from weakness in the thought framework itself. Application "breaks down" (1) because there is no accurate basis for determining *ex ante* the conditions that will exist *ex post*, and (2) because knowledge of factor-product relations is lacking. Even in the short run, say for one current production period, the exact contribution of any one physical (or value) input is not known with certainty. The best that can be done in practice is to make a reasonable estimate.

In the absence of technical knowledge of physical relations, allocation of returns to factors becomes a judgment. This judgment process is subject to improvement through making use of something more than the traditional rules of thumb that apparently guide actions in the current market.

The supply side of the land market is expressed in asking prices of sellers, and comparisons of any one farm with prices at which other farms in the community have sold cannot be used as the only guide to action in land evaluation. A buyer may need to meet asking prices if he is to acquire land. But whether or not to meet the asking price is still a matter for decision, in which some form of income-earning appraisal can serve as part of the basis for the decision.

Discussions of appraisal and particularly of the comparative sales method sometimes overlook the fact that the price in each sale is a value estimate performed by someone. In essence, what the buyer or seller who takes the market price as his value determinant is saying is that the estimate made by someone else is better than any estimate he could make.

In the long run and under equilibrium, factor price (annual) = marginal value product = value of marginal product = return to the factor = economic rent of land. In the short run, there can be and are differences. The annual use price of land may be above or below its calculated marginal value product. The market price may be above or below the estimated earning-capacity value.

Throughout the several steps in the value-determining process, the problem is one of making specific estimates. The evaluator is confronted with the task of determining quantities of outputs from given inputs, assigning value figures to inputs and outputs, translating flows into funds. Theory provides a framework within which the relevant variables may be analyzed and also a logic for handling interrelated variables. It provides thought guides with which to check the reasonableness of judgments on such specific variables as the annual earnings of land. But the evaluation process as a whole is in itself both a judgment and an analysis.

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